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The Assessment of Long-Term Manpower Requirements
La prévision à long terme de la demande de main-d'oeuvre

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Résumé de l'article

La demande de main-d'oeuvre à long terme est influencée par divers facteurs parmi lesquels on trouve: 1) le taux de croissance économique et sa composition par industrie et par région; 2) le taux de changement technologique; 3) le taux de croissance de la population, etc.

Certains problèmes de méthode se présentent dans la préparation de telles prévisions. En effet, il faut tenir compte du fait : a) que l'offre et la demande de main-d'oeuvre sont interdépendantes; b) que les méthodes de prévisions appropriées aux pays industrialisés diffèrent de celles appropriées aux pays sous développés ; et c) que les prévisions à moyen terme et à long terme sont influencées par les politiques adoptées à court terme.

On a utilisé diverses méthodes pour faire des prévisions de demande de main-d'oeuvre : 1) questionnaires adressés aux employeurs; 2) extrapolations; 3) études de la demande de main-d'oeuvre dans des pays ou régions plus industrialisés ; 4) études de la demande de main-d'oeuvre dans des nouvelles firmes et industries ; 5) études du changement dans la composition de la main-d'oeuvre et de l'emploi par occupation et par industrie à l'aide de tableaux genre input-output ; 6) modèles économétriques.

Quoique chacune de ses méthodes contribue au problème de prévision, aucune ne suffit par elle-même. L'auteur préfère cependant la méthode économétrique qui intègre des projections: 1) de population; 2) de main-d'oeuvre; 3) de production (globalement et par industrie) ; et 4) des ajustements pour le changement technologique et la diminution dans les heures de travail.

La discussion résume les travaux poursuivis présentement aux Etats-Unis et en France en ce qui a trait à la prévision à long terme de la demande de main-d'oeuvre.

En guise de conclusion, l'auteur suggère l'usage de la méthode économétrique afin de préparer des prévisions de demande de main-d'oeuvre pour des groupes d'occupations et des niveaux d'éducation assez largement définis.

Il suggère aussi une étude plus poussée du problème qui se présente dans la traduction des demandes par occupation en termes de durée et de catégorie d'enseignement, tout en notant qu'il n'y a pas de correspondance systématique entre la formation reçue et l'occupation d'un individu, un fait qui supporte une autre conclusion qui dit, le plus détaillée sera la prévision de demande de main-d'oeuvre, le moins elle sera utile.

The Assessment of Long-Term Manpower Requirements *

Pierre-Paul Proulx

In his paper, the author presents methods to forecast long-term manpower requirements : employer interviews, extrapolation of trends derived from historical data, standard growth curves, examination of the technology and manpower demand in new firms and industries, study of occupational growth prospects and requirements, comprehensive econometric models. And finally, the article contains a brief examination of French and American current research and practices in long-term manpower forecasting.

Introduction

The future manpower requirements of an increasingly interdependent and technological economy depend on a great number of factors such as : the rate of growth of the economy; the composition of that growth industrially and geographically; the rate of technological change, its nature and location; population growth and its location; and social and demographic trends, generally.

Forecasts of manpower demand are of interest to both public and private users. Employers planning production and plant expansion are concerned with the future manpower demand and supply situation they will have to face. Individuals concerned with vocational guidance, regional and local development, maximum growth and minimum unemployment in the economy, and last but not least educational planning, are vitally interested in such forecasts which can mean the difference between success and failures of their activities.

In a few words, the purpose of long-term manpower forecasts is to establish what the « employment expansion path » will be in country

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or region, and on the basis of that knowledge, undertake policies to move the economy's « skill endowment point » nearer to that path in order to minimize unemployment and inflation, and maximize growth. [1]

Theoretical research and practical experience in the field of long-term manpower forecasting are still so recent that a number of « obvious » comments may still be warranted. The following section of this paper contains such comments. It will be followed by a section reviewing alternative long-term manpower forecasting methods, and finally by concluding observations.

Some Preliminary Comments

The three brief observations that follow state some of the methodological problems which manpower demand forecasters may find helpful to keep in mind. Each one alludes to problems which would require much further research.

a) The fact that supply and demand are often interdependent should concern anyone making manpower forecasts. This is especially the case when projections are being prepared for high level and professional occupations, for supply often « creates » its own demand in such instances. Forecast of manpower balance by occupation can be of dubious value if the supply-demand interdependence is strong.

b) The manpower forecasting methods and assumptions appropriate in developing countries differ from those in developed countries in important respects. For example, while one may, in industrialized countries, assume full employment of manpower resources as an objective of public policy and make manpower forecasts on that basis, to do so would be quite misleading in developing countries, where full employment of labour resources is not an immediate goal given the greater growth constraints presented by real and financial capital.

c) Even without any general agreement about where the dividing line is to be drawn, manpower forecasts are often made for short term, medium term and long term periods. Although forecasting methods will vary to some extent according to the length of the time period, and although one can legitimately distinguish between short term, medium

(1) See B. BERMAN, « Alternative Measures of Structural Unemployment » in A. Ross (ed.) *Employment Policy and the Labor Market*, University of California Press, Berkeley 1965, pp. 256-268, for a discussion of these concepts.

term objectives and means, the distinction should not blur the fact that manpower development takes time, and that measures taken in the short and medium periods may have most of their impact only in the long term period.

Methods Utilized in Making Long-Term Manpower Forecasts

A number of different methods have been utilized to make long-term forecasts of manpower demand. These are listed below with brief comments. Since one of my tasks is to locate the long-term manpower forecast problem area, and since there are experts in some of these methods with us this morning, I shall comment in detail on only a few of these methods.

a) Employer Interviews

This procedure consists of asking a scientifically chosen sample of employers to make an estimate of their manpower requirements in 2, 5, 10 etc. years hence. These manpower requirement questions are often coupled with output projection questions in order to allow the analyst to check the validity of the manpower projections by examining the output per man-hour levels implied. The employment and output projections can be checked against independent estimates derived by some of the methods we shall discuss below.

There is no question that such interviews, since they draw upon the intimate knowledge of individuals in different industries, can be of some assistance for short term manpower demand forecasts, but even then, they have not proved to be too helpful as Hartle has demonstrated. [2] I would not be inclined to place much faith in them for medium or long-term manpower forecasts, although they might yield some useful supplementary information.

b) Extrapolation of Trends Derived from Historical Data

A mechanical application of simple linear regression analysis to historical data, in order to derive therefrom trends to project manpower demand, would not, in my opinion, be very helpful in pro-

(2) D. HARTLE, *The Employment Forecast Survey*, University of Toronto Press, 1962.

jecting long-term manpower requirements. Such extrapolations assume an unchanged relationship between the variables being analyzed, and we are concerned with long-term manpower forecasts precisely because such relationships vary. Such extrapolations may provide the minimum or maximum estimate of the demand for a particular category of labour, but they will usually have to be supplemented by different analyses and judgement.

c) Standard Growth Curves

This procedure consists a) of plotting data on employment by industry against total employment, in a number of countries, b) of noting the position on the curve of technically more advanced countries, and c) of assuming that the economy under study will follow approximately the same growth path as that exhibited by the more advanced countries.

This method yields a projection of what the composition of labour demand can be expected to be « X » years hence. Since one could borrow from other countries where such a method has been utilized eg. France, there is certainly no harm in examining the forecast yielded by the procedure along with others obtained by different methods. The limitations of these growth curves are obvious however : a) they are general and do not allow refined occupational breakdowns, b) they do not allow for alternative assumptions and reorganizations of the economy : c) they do not take account of the specific character of each country's economic structure.

d) Examination of the Technology and Manpower Demand in New Firms and Industries

The object of this exercise, which in some respects in similar to the « growth curve method », is to develop concepts, procedures, and measures of occupational requirements in new production facilities. The analyst seeks to examine the primary, secondary, tertiary, geographic, industrial, and income consequences arising from the establishment of new firms and industries. Such studies will be of more or less usefulness depending upon the growth rate and prospective size of the firms or industries being studied.

e) Study Occupational Growth Prospects and Requirements, by Industry, by Region, Through Employment Prospect Studies, Industry by Occupation Matrices, etc.

Occupational employment may be affected by a host of factors. Technological change is the most often discussed and is one of the most significant of these, but occupational changes can also be caused by many other factors such as : changes in union-management relationships and practices; changes in the relative manpower supply situation in different occcupations, eg. engineers and technicians; changes in the scale of operations, i.e. the number of overhead personnel is less flexible than is the number of production or operating workers as scale of operations rises or falls; shifts in market demand for the products of each industry;.

It should be obvious that no one technique can successfully project employment in all occupations. The growth in each occupation is affected by its own complex of factors and there is no substitute for an intimate knowledge of the preparation required for the occupation, the labour force life of its members etc. It follows therefore that some resources should be devoted to employment growth prospect studies for women, high school graduates, and various other groups which are becoming more important in the labour force.

It is of course desirable to keep these numerous studies within on overall integrated framework, and certain tools are available to check the results of these more intensive but diverse studies. It may be possible to check the manpower requirements in each occupation by distributing employment in each industry, by occupation, on the basis of information on the changing employment composition of each industry. An estimate of total requirements for each occupation can then be made by summing requirements for that occupation in all industries. More specifically, the exercise is to construct an industry by occupation matrix. In short, the preparation of one of these matrices requires : a) that estimates be prepared of the occupational composition of individual industries for future periods (the occupational composition of each industry would be in the form of the percent of total industry employment found in each occupation); b) that the future occupational ratios be applied to projection of employment in each industry, and c) that the products thus derived, be summed across all industries to arrive at total employment by occupation for the entire economy.

The number of people who have to be trained for each occupation can then be estimated by computing the net growth required in the occupation and the number of workers needed to replace those dying, retiring, or otherwise leaving the occupation. In other words, emphasis

should be placed on estimating replacement needs by occupation, over different time periods. The attention paid to occupational patterns of individual industries, is said to be useful because among other reasons it allows the analyst to make estimates of the extent to which change in the number of persons attached to any one occupation is due to intensive or extensive growth. [3]

f) Utilize Comprehensive Econometric Models to Make Long-Term Manpower Projections

The French especially believe that employment forecasting is only possible within the wider frame work of economic forecasting for which they utilize econometric analysis extensively. This belief is also gaining strength in the United States and a number of American economists are now attempting to construct econometric models to be utilized in making long-term manpower forecasts.

We shall examine the French and American approaches in this section of the paper, after having presented a brief discussion of general procedure and components in such models.

The major components and steps figuring in the econometric models developed to forecast long-term manpower demand are : a) a population forecast, b) a labour force forecast, c) production forecasts for the economy as a whole and by industry, d) the translation of these production forecasts into employment requiments through adjustments for changes in hours of work and productivity. We shall spend some time discussing the methods involved in making production forecasts and their translation into manpower requirements, but shall only take a few moments to discuss the population and labour-force forecasts.

In making the *demographic forecasts* to be utilized subsequently in these full pledged econometric models, the 15-65 component of the

(3) See H.D. WOODS and S. OSTRY, *Labour Policy and Labour Economics in Canada*. MacMillan of Canada, Toronto, 1962, p. 325, for a definition of these terms. Briefly the former (intensive growth) relates to the increase in the number of persons attached to an occupation due to the growth in importance of *that occupation within a given industry or industries.* The latter (extensive growth) relates to the change in the number of persons attached to an occupation due *to the growth of an industry* without any change in the importance of the occupation *within that industry.* N. M. MELTZ, in « Factors Determining Occupational Trends in the Canadian Economy », mimeographed, 1961, illustrates the use of this technique.

population is of most interest. If the purpose of the analyst is to make a forecast, for fifteen years or less, his task is made somewhat easier by the fact that the people are already born. The only adjustments he will make in such instances are for mortality, immigration, emigration, and if the forecast is a regional one, mobility. [4]

The *labour force forecast* which enters the econometric model rests upon the previous demographic forecast and an analysis of labour force participation rates. The procedure consists basically of projecting labour force participation rates by age and sex, weighing them by the future population, and summing the products to obtain total labour force estimates.

The success obtained in performing this projection depends mostly upon the success obtained in projecting the labour force participation rates. [5] Except for the rather stable labour force participation rates of men 25-54, it is my impression that use will have to be made of multiple regression analysis : to examine the effect of unemployment upon labour force participation rates; to study the effect on the labour force participation rates of adult women of the large number of young persons entering working age; to examine the factors of affecting withdrawal of older men from the labour force; to explain trends in part-time participation in the labour force etc . . .

Since the demand for labour is a derived demand, it is necessary to prepare *production forecasts* to make the estimates of long-term manpower demand.

The procedure consists first of all of making a projection of G.N.P. This can be performed in different fashions, eg. by statistical fits to historical data by the G.N.P.; by the application of Keynesian multiplier analysis, or by full fledged econometric models incorporating one or more of these methods. I shall not comment on the production

(4) See F.T. DENTON, Y. KASAHARA, and S. OSTRY, « Population and Labour Force Projections to 1970 » Economic Council of Canada, *Staff Study No. 1* for an example of this exercise.

(5) See F.T. DENTON, Y. KASAHARA and S. OSTRY, *op. cit.*, for such an exercise.

function procedure except to say that use has been made of both complete and truncated production functions. [6]

For short term and medium term output projections, use is often made of Keynesian multiplier analysis which coupled with an examination of autonomous changes in public or private investment or consumption expenditures provides a simple estimate of G.N.P.

For long term output forecasts attempts are being made to construct or utilize full-pledged econometric models. These econometric models consist in essence of definition equations, and reaction equations to determine imports, employment, unemployment, and price levels, for example. Such models incorporate some variables which are endogenous and others which are exogenous (eg. the level of import prices). It may be necessary for one part of the model to make income forecasts of consumer countries in instances where exports are an important part of domestic G.N.P.

The next step in this econometric approach to long term manpower demand estimates is to obtain output projections by industry. There are again a few possible methods to obtain these and we shall comment on them as we proceed, but as you can imagine, one of the methods consists of utilizing regressions of output by industry against total G.N.P. It is hoped by such regression analysis, to predict how output will vary in different industries in response to movements in total G.N.P. This regression analysis should also take into account some supply side considerations for costs enter the inter-industry output composition picture in the long run. These projections of output by industry can be cross-checked by examining the productivity and consumption trends they imply. They should also be based upon studies of consumption, and investment, and the price and income elasticities. Attempts should be made to study how the industrial composition of

(6) See M.E. LEVY, *Fiscal Policy Cycles, and Growth*, The Conference Board, Studies in Economics No. 81, pp. 59-104 for a discussion and application of these concepts. Briefly, the complete production function yields output projections on the basis of estimates of *both* labour supply and capital stock over time. The truncated production function yields output projections on the basis of either an estimate of labour supply over time, or capital stock over time. (One should recognize in constructing the labour input series, that any substitution of more skilled for less skilled labour, yields an increased labour input which escapes measurement if labour inputs are measured in terms of undifferentiated man hours). A real theoretical problem which remains to be solved is the construction of a full (or complete) production function which allows for subtitutability between the factor inputs.

output would vary given different overall growth rates and *different* changes in consumption and investment patterns.

If the output projections are being made from a provincial or regional point of view, attempts should perhaps be made to determine the extent to which such output is influenced by local and national industries. It would be helpful in such instances, to construct models yielding output and employment by industry and occupation for *local areas grouped* according to their urban or rural characteristic and according to their basic dependence on a single or many industries. Such models could then be applied to other areas with similar economic bases.

The last step in these *ambitious* econometric models is to translate the global and industry production forecasts into estimates of the demand for workers in total, by industry, by occupation, and by skill and educational level.

As indicated earlier, this is made by introducing adjustments for changes in hours of work [7] and changes in productivity.

Various departments of labour, here in Canada and abroad, have been preparing technological outlook studies which are helpful for making the latter type of adjustment. These studies made a useful contribution to this stage of the econometric long-term manpower forecasting approach by examining the nature of impending changes in equipment, products, processes, materials, by reporting on the current status of the innovations by establishing the trends in their usage, and by analyzing the implications of these changes for labour productivity, occupational changes, collective bargaining, etc . . .

These technological outlook studies can take the form of case studies at the industry or at the establishment level. They can, for example, either study innovations and adjustments to technological change in key industries or they can study different types of innovations which have an impact on a large number of industries.

One type of adjustment which may help to translate from output to manpower requirements is the Verdoorn adjustment which consists of

(7) See E.F. DENNISON, *The Sources of Economic Growth in the U.S. and the Alternatives Before Us*, C.E.D., 1962 for a discussion of this topic.

adjusting for the relationship between productivity and the absolute volume of production.

A further step in the translation from output into manpower requirements consists of converting the estimates of the *stock* of workers required in different years into *flow* figures. This can be performed by taking into account replacement rates for different occupations.

Optimally, one would hope to develop manpower supply projections to match with the manpower demand projection discussed above. Manpower supply projections, which enter into the output projections, are also desirable because when set opposite demand projections, they allow estimates of *deviations* between the manpower demand and supply in different occupations or groups of occupations.

Given the nature of the statistics we have to work with, however, it would probably be asking too much to expect estimates of manpower *balance* to be made at very low levels of aggregation.

Another adjustment which is often contemplated in the long-term econometric forecasts of manpower demand is one for feed-back effects, i.e. the forecast of a process may affect the course of another process or the course of the process itself eg. if the model workers forecast a shortage of manpower in a certain still group, planners and policy makers may decide to change the educational system, or control a formerly uncontrolled process etc . . . One may not be so ambitious of course, and may simply keep the projections up to date, by regular revisions.

A final step in this process is to translate the estimates of manpower requirements into demand for skills and education. Educational planning is in fact one of the most important reasons for which long-term manpower projections are undertaken. The problem of translating into educational and skill requirements is a complex one which we shall not discuss here; but I would like, however, with your indulgence, to make a few comments which indicate the direction in which I believe further research would be fruitful in this area.

One problem facing educational planners is the reaction time or lag necessary to turn out certain types of skills. What this calls for is a model of the school system with estimates and coefficients indicating the percentage of primary school leavers applying for various

types of secondary training, the percentage of these reaching final stages of their respective programmes etc . . . It would seem important to gain knowledge of these magnitudes as soon as possible, because forecasts of manpower imbalances in 1971 may well necessitate action in 1965, for example.

Another problem inherent in attempts to translate manpower demand into skill and educational requirements is that of the correlation or relationship between occupations, skills, and levels of education. I believe that research funds would be well spent in attempts to determine the duration and type of education most desirable for certain *broad* groups of occupations, the demand for which we may be able to forecast reasonably accurately ten or fifteen years hence. This might consist, in the preliminary stages, of a classification of the percentage of certain broad occupational groups by level of skill, with some attempt to cross classify by number of years and type of training required beyond primary school.

g) A Brief Examination of French and American Current Research and Practices in Long-Term Manpower Forecasting

En France on se sert d'une variante très intéressante de la méthode économetrique décrite ci-haut. Utilisant des hypothèses de croissance différentes, on évalue la production par secteur d'où l'on déduit, par sommation, la valeur du Produit National. Ensuite on recherche quelle sera la valeur et la structure de la consommation des ménages. La demande finale des ménages est ensuite décomposée par nature du produit, en dix (10) postes. Cette décomposition est obtenue en appliquant des coéfficients d'élasticités exprimant la variation relative de la demande des divers biens et services en fonction de celle de la dépense globale de consommation. On tient compte que ces élasticités sont variables selon le groupe socio-professionnel des consommateurs et on distingue exploitants et ouvriers agricoles; travailleurs indépendents; cadres supérieurs; autres salariés non actifs.

Les tableaux d'échanges inter-industriels permettent de passer de la demande finale par produit à la production nécessaire dans chaque secteur. On vérifie que l'évolution des prédictions ainsi obtenues soit cohérente avec celle des valeurs, ajoutées, par secteur, et on parvient enfin à une certaine évaluation de la main d'oeuvre et de la production par secteur. Ces perspectives globale par secteur servent ensuite d'ob-

jectif aux études analytiques des Commissions du Plan spécialisées dans l'étude de chacun des secteurs.

Current research on long-term manpower demand forecasts in the U.S. is also making use of econometric models. American economists associated with the U.S. Department of Labour are constructing an econometric model of manpower demand which is described as follows. [8] It begins with alternative assumptions of total income and output, and distributes this output among various categories and components of final demand for consumption, government expenditure and foreign trade.

These estimates of final demand are then converted into direct and indirect output of all supporting industries which contribute materials, parts, components, fuels and transportation and distribution services. To do this, use will be made of inter industry sales and purchases in the economy, and a projection of these to reflect anticipated change in technology and relative costs. The projected inter industry relationships will therefore serve to convert projections of end product deliveries in estimates of output required from each industry. This data, along with projections of hours of work and unit labour requirements will serve as the basis for comprehensive and consistent estimates of the demand for labour on an industry by industry basis. The next step will be to distribute the industry employment requirements on the basis of projections of occupational patterns by industry, utilizing occupation by industry matrices. On the basis of this model then, it is hoped to gain knowledge for estimating both shortages and surplus of labour, and thus be more rational in setting up future manpower training programmes. The Bureau of Labour Statistics in the U.S. has recently initiated an Inter-Agency Growth Project, the objectives of which are to provide an integrated framework for evaluating long-term manpower problems. They plan to utilize a conventional input-output approach coupled with different assumptions on growth of population, labour force, hours, and productivity. They will examine the implications of alternative growth rates and alternative growth patterns. They are building various sub-models. In their first sub model they are estimating a constant dollar G.N.P. series. In their second sub-model they are projecting national income and product accounts to get a balanced set of national income

(8) See R.A. Gordon (ed.) « Long-Term Manpower Projections », Institute of Industrial Relations, Univ. of California, Berkeley 1965, mineo, for more thorough descriptions of these models.

accounts and obtain estimates of investment receipts and expenditures, savings, and investment etc . . .[9] Their third sub-model incoroporates some of the results obtained in their previous models. It proposes :

1) To project final demand, output and employment, in input-output detail.
2) To estimate the total output of each industry (including intermediate products) by using the input-output table and projections of final demand.
3) To translate industry output into manpower requirements utilizing productivity projections to go from output to labour demand. In doing so they note that they will take into account the shift in demand from commodity to non-commodity sectors.

James Tobin and R. Solow are also undertaking a project in this area of long-term manpower forecasts. It is known as the Yale-M.I.T. Project and is similar in outlime to the B.L.S. Project except that it replaces the input-output analyis by production functions. The authors indicate that in measuring labour they will not utilize only man-hours, but look for something basic i.e. education.

Concluding Comments

Since it was my understanding that I had come here to lead a discussion on long-term manpower projections, I shall close by listing briefly a few research suggestions and conclusions which I derive from the foregoing discussion.

The first conclusion I draw is a negative one. It is that the longer the time horizon and the greater the detail put into manpower demand forecasts the more they become meaningless. This is due by and large to the erudeness of our empirical methods, to the poor quality of our statistics and to the complexity of economic relationships.

I would prefer a more aggregative approach consisting of an integrated model which could be applied to generate long-term manpower demand forecasts for *broad* skill and educational groups without going into much occupational detail. It would of course be necessary to supplement the aggregative model by employment prospect studies, tech-

(9) See M. LEVY, *op. cit.*, pp. 32-45.

nological outlook studies etc . . . but these would be subordinated to the comprehensive model and would serve to check the projections it is yielding.

Needless to say, such an exercise would be of little assistance without further knowledge of the relationship between education level and occupation, between skill level and occupation. The number of years of education an individual has achieved tells little about his occupational experience, his individual aptitudes and the value of different types of education. Psychometrics could be of considerable assistance to the labour market analyst in this task, for it could possibly help him to devise a more meaningful manpower demand structure in terms of which to make forecasts. This new more meaningful manpower demand structure may be a new occupational classification based on common characteristics such as dexterity, intelligence quotient, relation of the occupation to objects, and to people. Research in this direction would perhaps lead to a reorganization of our educational system in such a way as to obviate the need for detailed long-term manpower demand forecasts by narrow occupational groups. [10]

If the model of manpower demand projection is regional I would favour the development of models of employment projections by industry and occupation, for local areas grouped according to their urban or rural character and according to their basic dependence on a single or many industries. These models could subsequently be applied to other areas with similar economic bases.

It is my impression that research on : 1) the changes in wage and income structures; 2) hiring, firing, promotion and layoff procedures, needed to adapt, or to adopt to, different manpower demand and supply situations would be helpful.

The sociologist would also be of assistance to the labour market analyst if he provided analysis relating to such factors as cultural pres-

(10) It is my impression that one would discover individuals with widely different types of vocational, technical, etc. . . training and education in most occupations; or to restate the fact slightly differently, it is my impression that one would discover that graduates from any one course or with any one degree obtain employment in widely different occupations. Such a discovery would indicate the need for a more general orientation in our formal educational system, with specialized training being offered only for the professions and by and large by industry subsidized by government.

sures, role identities and conflicts, occupational prestige, and social situation in different occupations for these influence vocational decisions and would be of importance for anyone concerned with manpower balance forecasts.

Continued research and emphasis should be given to high level manpower demand and supply projections for the reaction times and lags involved in producing such manpower make this of utmost importance.

The last conclusion (or bias) I wish to state is that I believe that it is still quite fruitful to study current shortages in the labour market for a recent U.S. study indicates that at the end of 1964, « most unfilled requirements for skills were for occupations which had long been in short supply. [11]

This type of current analysis should be supplemented by an examination of the response of the labour market to higher levels of aggregate demand, that is, by an examination of which industries, which occupations, which regions, etc . . . will expand as aggregate demand increases and which will continue to stagnate.

LA PRÉVISION À LONG TERME DE LA DEMANDE DE MAIN-D'OEUVRE

La demande de main-d'oeuvre à long terme est influencée par divers facteurs parmi lesquels on trouve : 1) le taux de croissance économique et sa composition par industrie et par région ; 2) le taux de changement technologique ; 3) le taux de croissance de la population, etc.

Certains problèmes de méthode se présentent dans la préparation de telles prévisions. En effet, il faut tenir compte du fait : a) que l'offre et la demande de main-d'oeuvre sont interdépendantes ; b) que les méthodes de prévisions appropriées aux pays industrialisés diffèrent de celles appropriées aux pays sous développés ; et c) que les prévisions à moyen terme et à long terme sont influencées par les politiques adoptées à court terme.

On a utilisé diverses méthodes pour faire des prévisions de demande de main-d'oeuvre : 1) questionnaires adressés aux employeurs ; 2) extrapolations ; 3) études

(11) « Employment Service Operating Data as a Measure of Job Vacancies », *Employment Service Review* April/65, Office of Manpower Analysis and Utilization, U.S. Employment Service, Bureau of Economic Statistics.

de la demande de main-d'oeuvre dans des pays ou régions plus industrialisés ; 4) études de la demande de main-d'oeuvre dans des nouvelles firmes et industries ; 5) études du changement dans la composition de la main-d'oeuvre et de l'emploi par occupation et par industrie à l'aide de tableaux genre input-output ; 6) modèles économétriques.

Quoique chacune de ses méthodes contribue au problème de prévision, aucune ne suffit par elle-même. L'auteur préfère cependant la méthode économétrique qui intègre des projections : 1) de population ; 2) de main-d'oeuvre ; 3) de production (globalement et par industrie) ; et 4) des ajustements pour le changement technologique et la diminution dans les heures de travail.

La discussion résume les travaux poursuivis présentement aux Etats-Unis et en France en ce qui a trait à la prévision à long terme de la demande de main-d'oeuvre.

En guise de conclusion, l'auteur suggère l'usage de la méthode économétrique afin de préparer des prévisions de demande de main-d'oeuvre pour des groupes d'occupations et des niveaux d'éducation assez largement définis.

Il suggère aussi une étude plus poussée du problème qui se présente dans la traduction des demandes par occupation en termes de durée et de catégorie d'enseignement, tout en notant qu'il n'y a pas de correspondance systématique entre la formation reçue et l'occupation d'un individu, un fait qui supporte une autre conclusion qui dit, le plus détaillée sera la prévision de demande de main-d'oeuvre, le moins elle sera utile.